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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,892	03/31/2004	Peter N. Comley	38190/274036	5765

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EXAMINER	
BEVERIDGE, RACHEL E	
ART UNIT	**PAPER NUMBER**
1725	

DATE MAILED: 11/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

c

Office Action Summary	Application No.	Applicant(s)
	10/813,892	COMLEY ET AL.
	Examiner	Art Unit
	Rachel E. Beveridge	1725

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1, 2, 4-12, 16-23, and 36-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 4-12, 16-23, and 36-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claim 42 is objected to because of the following informalities: "the blank" (line 2) references one blank rather than the multiple blanks of the independent claim. The examiner interpreted this limitation to be "the blanks" of claim 36. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisert et al. (US 4,882,823) in view of Ruckle et al. (US 3,713,207) (hereinafter referred to as Ruckle '207), Ruckle et al. (US 4,982,893) (hereinafter referred to as Ruckle '893), and Movchan et al. (WO 95/13406).

Weisert discloses an invention for diffusion bonding and superplastic forming hollow components such as aircraft engine components (i.e. gas turbine compressor fan blades) (Weisert, col. 1, lines 5-10). Weisert discloses superplastically forming "reactive" metals including titanium (Weisert, col. 3, lines 49-53) and further teaches a preferred material of Ti-6Al-4V superplastically formed at general temperature ranges including 1450°F-1750°F (Weisert, col. 4, lines 15-18). Weisert also teaches diffusion

bonding the preferred Ti-6Al-4V material at 25-300 psi for about 30 minutes (Weisert, col. 4, lines 19 and 28). Weisert discloses heating each blank to within a diffusion bonding temperature range of each blank (Weisert, col. 4, lines 12-15), and diffusion bonding the first blank to the second blank (Weisert, col. 4, lines 59-64 and 15-19). Furthermore, Weisert discloses flat surfaces (14,20) positioned in abutting relation to each other of to the opposite flat sides of the intermediate flat core sheet (24), and teaches subjecting the sheets (12,18,24) to diffusion bonding conditions in appropriate tooling (27) to bond the flat surfaces (14,20) to each other or to the core sheet (24) other than where the stop-off material was applied, thereby forming a diffusion bonded sandwich (29) (Weisert, col. 4, lines 56-64). See figure 2B. Weisert also discloses that superplastic behavior enhances formability under compressive strain conditions (Weisert, col. 3, lines 47-49). Therefore, the properties and method of invention are so similar with that of the applicant's claimed invention it is necessarily present to arrive at the specified strain rates of claims 11 and 12. However, Weisert lacks disclosure of specific grain sizes for the titanium blank and a diffusion bonding temperature less than 1450°F. Ruckle '207 generally teaches a superplastic titanium alloy with a grain size of about 1 micron (Ruckle '207, col. 4, lines 46-48 and col. 2, lines 63-67 through col. 3, lines 1-3). Ruckle '893 discloses diffusion bonding multiple titanium alloy blanks at a temperature of less than 1450°F (Ruckle '893, col. 2, lines 19-23). Combined the invention of Wesiert, Ruckle '207, and Ruckle '893 lack specific disclosure of superplastically forming the titanium alloy blanks at a temperature of less than 1450°F; however, Movchan discloses superplastic deformation of titanium alloy blanks at

temperatures between 650-760°C (1202-1400°F) and includes Ti-6Al-4V as example of such a titanium alloy (Movchan et al., p. 3, lines 22-26 and p. 5, lines 28-31). Thus, it is obvious to arrive at a common superplastic forming temperature between 1400°F and 1450°F based on both the disclosures of Weisert and Movchan (claim 10). Movchan also discloses strain rates for superplastic formation of titanium alloy of at least about 6 x 10^{-4} per second and 1 x 10^{-3} per second (Movchan et al., p. 5, lines 30-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26).

Claims 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisert et al. (US 4,882,823), Ruckle et al. (US 3,713,207) (hereinafter referred to as Ruckle '207), Ruckle et al. (US 4,982,893) (hereinafter referred to as Ruckle '893), and

Movchan et al. (WO 95/13406) as applied to claim 1 above, and further in view of Stacher (US 5,118,026).

With respect to claim 5 and 6, Weisert, Ruckle '207, Ruckle '893, and Movchan lack disclosure of pickling the surface of the workpiece to remove any formed oxide during the superplastic forming step. Stacher discloses the fabrication of titanium aluminide sandwich structures that combines the process of metal joining and superplastic forming (Stacher, col. 3, lines 26-29). Stacher states that titanium is particularly sensitive to oxygen, nitrogen, and water vapor content in the air at elevated temperatures (Stacher, col. 2, lines 33-35). Stacher further teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined invention of Weisert Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

With regard to claim 7, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Thus, with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed pickling rate. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify

the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

Regarding claim 8, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Thus, with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed amount of oxide to be removed from the surfaces. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53).

With respect to claim 9, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Weisert also discloses the average thickness of the diffusion bonded sandwich between 5 mils (thousands of an inch) and about 150 mils (Weisert, col. 5, lines 6-10). Thus, with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed thickness. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify

the invention of Weisert to include the thickness of Weisert in order to obtain a uniform mass distribution (thickness) of the sheets and therefore prevent rupturing of the truss core during superplastic forming (Weisert, col. 5, lines 16-19), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

Claims 16-23 and 36-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisert et al. (US 4,882,823) in view of Ruckle et al. (US 3,713,207) (hereinafter referred to as Ruckle '207), Ruckle et al. (US 4,982,893) (hereinafter referred to as Ruckle '893), Movchan et al. (WO 95/13406), and Stacher (US 5,118,026).

With respect to claim 16-19, 21-23, 36-39, 41, and 42, Weisert discloses an invention for diffusion bonding and superplastic forming hollow components such as aircraft engine components (i.e. gas turbine compressor fan blades) (Weisert, col. 1, lines 5-10). Weisert discloses superplastically forming "reactive" metals including titanium (Weisert, col. 3, lines 49-53) and further teaches a preferred material of Ti-6Al-4V superplastically formed at general temperature ranges including 1450°F-1750°F (Weisert, col. 4, lines 15-18). Weisert also teaches diffusion bonding the preferred Ti-6Al-4V material at 25-300 psi for about 30 minutes (Weisert, col. 4, lines 19 and 28). Weisert discloses heating each blank to within a diffusion bonding temperature range of

each blank (Weisert, col. 4, lines 12-15), and diffusion bonding the first blank to the second blank (Weisert, col. 4, lines 59-64 and 15-19). Furthermore, Weisert discloses flat surfaces (14,20) positioned in abutting relation to each other of to the opposite flat sides of the intermediate flat core sheet (24), and teaches subjecting the sheets (12,18,24) to diffusion bonding conditions in appropriate tooling (27) to bond the flat surfaces (14,20) to each other or to the core sheet (24) other than where the stop-off material was applied, thereby forming a diffusion bonded sandwich (29) (Weisert, col. 4, lines 56-64). See figure 2B. Weisert also discloses that superplastic behavior enhances formability under compressive strain conditions (Weisert, col. 3, lines 47-49). Therefore, the properties and method of invention are so similar with that of the applicant's claimed invention it is necessarily present to arrive at the specified strain rates of claims 22, 23, and 42 and the specified "about 1425°F" of claim 21. However, Weisert lacks disclosure of specific grain sizes for the titanium blank and a diffusion bonding temperature less than 1450°F. Ruckle '207 generally teaches a superplastic titanium alloy with a grain size of about 1 micron (Ruckle '207, col. 4, lines 46-48 and col. 2, lines 63-67 through col. 3, lines 1-3). Ruckle '893 discloses diffusion bonding multiple titanium alloy blanks at a temperature of less than 1450°F (Ruckle '893, col. 2, lines 19-23). Combined the invention of Wesiert, Ruckle '207, and Ruckle '893 lack specific disclosure of superplastically forming the titanium alloy blanks at a temperature of less than 1450°F; however, Movchan discloses superplastic deformation of titanium alloy blanks at temperatures between 650-760°C (1202-1400°F) and includes Ti-6Al-4V as example of such a titanium alloy (Movchan et al., p. 3, lines 22-26 and p. 5, lines 28-

31). Thus, it is obvious to arrive at a common superplastic forming temperature between 1400°F and 1450°F based on both the disclosures of Weisert and Movchan (claims 21 and 41). Movchan also discloses strain rates for superplastic formation of titanium alloy of at least about 6×10^{-4} per second and 1×10^{-3} per second (Movchan et al., p. 5, lines 30-31). The combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan does not disclose pickling the surface of the workpiece to remove any formed oxide during the superplastic forming step. Stacher discloses the fabrication of titanium aluminide sandwich structures that combines the process of metal joining and superplastic forming (Stacher, col. 3, lines 26-29). Stacher states that titanium is particularly sensitive to oxygen, nitrogen, and water vapor content in the air at elevated temperatures (Stacher, col. 2, lines 33-35). Stacher further teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207,

Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53) and to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

With respect to claims 20 and 40, Stacher teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55). Weisert also discloses the average thickness of the diffusion bonded sandwich between 5 mils (thousands of an inch) and about 150 mils (Weisert, col. 5, lines 6-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Weisert in order to obtain a uniform mass distribution (thickness) of the sheets and therefore prevent rupturing of the truss core during superplastic forming (Weisert, col. 5, lines 16-19), and further to modify the invention of Weisert to include the grain size of typical titanium alloy of Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34), and further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and

bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26), and further to modify the combined invention of Weisert, Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to remove an accurate amount of oxide to obtain the maximum obtainable joint strength (Stacher, col. 2, lines 50-53) and to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rachel E. Beveridge whose telephone number is 571-272-5169. The examiner can normally be reached on Monday through Friday, 9 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

reb
October 29, 2006

Jonathan Johnson
Primary Examiner